

WHAT IS CLAIMED IS:

1. A composition comprising:
  - a) a mammalian cell cytoplasmic extract;
  - b) a methylated cap analog; and
  - c) a cap-labeled mRNA substrate.
2. The composition of claim 1 wherein said mammalian cell cytoplasmic extract is an S100 extract which comprises a 100,000 x g, 1 hour supernatant from a mammalian cell lysate.
3. The composition of claim 2 wherein said extract is prepared by dialysis of a said extract containing 10% glycerol.
4. The composition of claim 1 wherein said mammalian cell lysate is obtained from a mammalian cell or tissue.
5. The composition of claim 4 wherein said mammalian cell is a HeLa cell.
6. The composition of claim 1 wherein said methylated cap analog is <sup>7me</sup>GpppG or <sup>7me</sup>GTP.
7. The composition of claim 1 comprising components for additionally detecting mRNA deadenylation and degradation.
8. The composition of claim 7 wherein said mammalian cell cytoplasmic extract is depleted of activity of proteins that bind polyadenylate.

9. The composition of claim 1 wherein said cap-labeled mRNA substrate is labeled at the alpha phosphate of the cap.
10. The composition of claim 9 wherein said label is a radioactive label, a non-radioactive isotopic label, a fluorescent moiety, a visibly-detectable moiety, a releasable substrate or a co-factor for a chemical or enzymatic reaction.
11. The composition of claim 1 wherein said cap-labeled mRNA substrate comprises poly(A) or at least one RNA element.
12. The composition of claim 11 wherein said RNA element is an AU-rich element.
13. The composition of claim 11 wherein said RNA element is a pyrimidine-rich element.
14. A polypeptide which has a molecular weight of about 50 to about 100 kilodaltons (kD) in molecular exclusion chromatography, precipitates with 20% ammonium sulfate, elutes at between about 440 to 500mM NaCl from a heparin-Sepharose column, and decaps mammalian RNA.
15. A polynucleotide which encodes a polypeptide which has a molecular weight of about 50 to about 100 kilodaltons (kD) in molecular exclusion chromatography, precipitates with 20% ammonium sulfate, elutes at between about 440 to 500mM NaCl from a heparin-Sepharose column, and decaps mammalian RNA.
16. An antibody which binds specifically and with high affinity to a polypeptide which has a molecular weight of about 50 to about 100 kilodaltons (kD) in molecular exclusion chromatography, precipitates with 20% ammonium sulfate, elutes at between about 440 to 500mM NaCl from a heparin-Sepharose column, and decaps mammalian RNA.

17. A kit for *in vitro* mammalian mRNA decapping comprising:
- a) a mammalian cell cytoplasmic extract; and
  - b) a methylated cap analog.
- 5 18. The kit of claim 17 further comprising a cap-labeled mRNA substrate.
19. The kit of claim 18 wherein said cap-labeled mRNA substrate is labeled at the alpha phosphate of the cap.
- 10 20. The kit of claim 19 wherein said label is a radioactive label, a non-radioactive isotopic label, a fluorescent moiety, a visibly-detectable moiety, a releasable substrate or a co-factor for a chemical or enzymatic reaction.
- 15 21. The kit of claim 17 wherein said mammalian cell cytoplasmic extract is depleted of activity of proteins that bind polyadenylate.
22. A method for carrying out *in vitro* mammalian mRNA decapping comprising the steps of
- a) providing the composition of claim 1,
  - 20 b) incubating said composition at about 30°C for about 30 min and monitoring decapping by detection of release of label from said cap-labeled RNA.
23. A method for identifying a compound as a modulator of mammalian mRNA decapping comprising carrying out the method of claim 22 in the presence and absence of said
- 25 compound, and correlating any change in decapping by the presence of said compound with modulator activity of said compound.
24. The method of claim 23 wherein said cap-labeled mRNA substrate comprises poly(A) or at least one RNA element.

25. The composition of claim 23 wherein said RNA element is an AU-rich element.

26. The composition of claim 23 wherein said RNA element is a pyrimidine-rich element.